

REMARKS

All the claims submitted for examination in this application have been rejected on substantive grounds. Applicants have amended their claims and respectfully submit that all the claims submitted in this application are patentable over the rejection of record.

Five substantive grounds have been imposed in the outstanding Official Action. The first of these is directed to Claims 1, 2, 6, 17 and 18. These claims stand rejected, under 35 U.S.C. §102(b), as being anticipated by U.S. Patent 5,927,620 to Memon.

Independent Claims 1 and 17, from which all the remaining claims ultimately depend, have been amended, and as amended are clearly novel over Memon.

Turning first to the process of Claim 1, that claim has been amended by adding two processing steps that occur prior to the chilling step in original Claim 1. Specifically, Claim 1 has been amended to include the requirement that ferrous metal is removed from the original stream of granulated used rubber particles followed by the screening and removal of fiber from that stream. That the Official Action indicates that dependent claims that recite processing steps upstream of the cooling step are novel over Memon, establishes that the aforementioned amendment to Claim 1 predicates novelty over Memon.

A similar amendment has been made to the apparatus of Claim 17. Claim 17 has been amended to add two components of the apparatus disposed upstream of the chilling means. As such, this amendment, like the amendment to Claim 1, establishes novelty of the apparatus of Claim 17 over the disclosure in Memon.

The second substantive ground of rejection is directed to Claims 11-15, 24-25 and 27-34. These claims stand rejected, under 35 U.S.C. §103(a), as being unpatentable over

Memon. The Official Action argues that these claims represent obvious design modifications which would be apparent to one skilled in the art once the basic process is known.

It is noted at the outset that among the aforementioned claims subject to this second rejection of record, Claims 11 and 12 have been amended to correspond to the amendment to Claim 1, from which Claim 11 depends and from which Claim 12 ultimately depends. Similarly, Claims 24, 25, 27, 29, 30 and 34 have been also amended to correspond to the amendments made to Claim 17, from which these claims directly or ultimately depend.

The rejection of record is predicated on the language of original Claims 1 and 17 which, as stated above, have been amended to incorporate limitations not present in those original claims. As such, the assumption regarding this ground of rejection has been made moot. Suffice it to say, Claims 11-15, 24, 25 and 27-34, which, as amended, each include the requirement for ferrous metal and fiber removal prior to cryogenic cooling of the rubber particles, establish their patentability over the teaching of Memon.

The aforementioned conclusion is implicitly conceded by the Official Action in which claims including these processing and apparatus limitations of ferrous metal and fiber removal prior to cryogenic cooling were subject to a rejection requiring the imposition of a further secondary reference, Azar. That is, the third substantive ground of rejection is directed to Claims 3-5, 7, 10 and 19. Claims 3-5, 7, 10 and 19 stand rejected, under 35 U.S.C. §103(a), as being unpatentable over Memon taken in view of U.S. Patent No. 5,385,307 to Azar.

All of the aforementioned claims, subject to this third ground of rejection, include limitations directed to subject matter that has been introduced into independent Claims 1 and 17, from which each of the aforementioned six claims depend. That is, these claims require ferrous metal and fiber removal prior to cryogenic cooling. As such, the application of Azar in support

of the proposition that such processing and limitations are obvious establish the absence of such a teaching in Memon.

Turning to the Azar disclosure, that disclosure describes a process in which fiber and steel is removed from used rubber particles subsequent to cryogenic cooling and comminution of used tires. This teaching is significantly distinguished from the amended independent Claim 1 process and apparatus Claim 17. Both of these claims require ferrous metal and fiber removal steps prior to cryogenic cooling and communication.

The Official Action recognizes this weakness in Azar by arguing that the particular time of separation within the process would have been an obvious modification by one skilled in the art. Indeed, this would be the case if the resultant process and apparatus would not be affected by postponment in initial ferrous metal and fiber removal until after cryogenic cooling and comminution of the rubber particles. However, this is not the case. There are important advantages obtained by preliminary removal of ferrous metal and fiber from the charge that is cryogenically cooled and thereupon comminuted.

Those skilled in the art are aware that the additional mass of ferrous metal and fiber increase the cooling costs associated of the introduction with a cryogenic fluid to freeze the rubber particles prior to comminution. Significant heat that would otherwise be removed from rubber particles is removed in lowering the temperature of the retained ferrous metal and fibers. The pre-removal of much of the ferrous metal and fibers present in the stream of granulated used rubber particles eliminates this unnecessary lose of cryogenic fluid freezing capability.

A second, even more significant, advantage of the process and apparatus of the amended claims in the present application over the combined teaching Memon and Azar, wherein ferrous metal and fiber is removed prior to cryogenic cooling, resides in the

comminution step wherein the frozen rubber particles are comminuted to sizes appropriate for the production of crumb and powder rubber. In that comminution step, ferrous metal and fiber not removed prior to cryogenic cooling reduces the efficiency of that step because comminution is practiced on materials which have no value and must be removed prior to packaging of the final crumb or powder rubber.

Of significant concern is the presence of ferrous metal in the comminution step of the process and apparatus taught by the combined teaching of Memon and Azar but which is absent in the claimed process and apparatus in the present application. That ferrous metal seriously erodes the metal components of the impact mill used to comminute the frozen particles of the present application. It is apparent that the resultant violent metal-on-metal impact has a deleterious affect on comminution as well as adversely significantly increasing maintenance cost, and downtime and reducing the useful life of the comminution means.

Yet another adverse effect of the failure of the combined teaching of Memon and Azar to remove fiber prior to cryogenic cooling is the difficulty of their removal subsequent to the comminution of the frozen rubber particles. As indicated in the specification of the present application, fiber removal is effectuated by aerodynamic separation. Those skilled in the art are aware that such separation becomes much more difficult as particle size decreases. Thus, comminuted fibers become much more difficult to separate from comminuted rubber particles at the smaller particle size that results after comminution of the cryogenically frozen particles.

The above remarks are supplemental by an even more dramatic difference between the teaching of Azar and the process of the present application. It would not be obvious, even if the aforementioned remarks did not apply, to compare the process and apparatus taught by Azar with that claimed in the present application. Whereas the used rubber employed

upstream of the cryogenic step in Azar is a tire carcass, from which ferrous metal and fiber could not be easily removed, the claims of the present application are limited to one wherein the initial stream of rubber particles, upstream of the cryogenic cooling step, is granulated used rubber particles.

Attention is directed to amended Claims 1 and 17 wherein the initial charge, from which ferrous metal and fiber is removed, is a stream of used granulated particles. As such, the teaching of Azar, and thus the combined teaching of Memon and Azar, is totally removed from the teaching of the present application in the absence of the aforementioned significant advantages obtained by ferrous metal and fiber removal prior to cryogenic cooling and subsequent comminution. Clearly then, the claims of the present application are patentable over the combined teaching of Memon and Azar.

It is noted in passing that Claim 3 has been cancelled in favor of new process Claim 43. Claim 43 incorporates processing the limitations of Claim 3 in a manner consistent with the amendment of Claim 1. Specifically, new Claim 43 sets forth a process of preparing a stream of granulated used rubber particles of the type employed in step (a) of amended Claim 1. Claim 43 thus incorporates the processing steps indicated by reference numerals 2, 3, 4 and 6 of Fig. 1. In this regard, it is noted that the limitations of steps (a) and (b) of amended Claim 1 and amended components (a) and (b) of amended Claim 17 are supported by reference numerals 30 and 32 depicted in Fig. 1.

Another new process claim, Claim 44, dependent from Claim 1, has been added to the application to cover the process wherein used rubber particles are introduced into the process at reference numeral 11, as set forth in Fig. 1.

It is furthermore emphasized that Claim 19 has been cancelled in favor of new Claim 45 to better conform the limitations contained therein to the amendment of dependent Claim 17, from which cancelled Claim 19 depended and from which newly added apparatus Claim 45 now depends.

The fourth substantive ground of rejection is directed to Claims 20-23 and 26. Claims 20-23 and 26 stand rejected, under §35 U.S.C. 103(a), as being unpatentable over Memon in view of Azar taken in further view of U.S. Patent No. 4,025,990 to Lovette, Jr.

The Official Action admits that the combination of Memon and Azar does not disclose the recycling of oversized material for further crushing to the desired product. To overcome this failing, Lovette, Jr. is applied for its alleged disclosure of this aspect of the process and apparatus of the present application.

Lovette, Jr. does disclose the recycling of oversized rubber particles. However, this step occurs downstream of the comminution step, denoted by Lovette, Jr. at 4, subsequent to cryogenic freezing. Claims 20-23, subject to this ground of rejection, are directed to an apparatus wherein secondary granulation occurs upstream of cryogenic cooling. Therefore, the process of Lovette, Jr. does not address applicants' apparatus defined by Claims 20-23.

Claim 26 is even further removed from the teaching of Lovette, Jr. That claim defines an apparatus which includes a storage bin with a metering discharge through which granulated used rubber particles, from which ferrous metal and fiber has been removed, in two and three separate operations, respectively, is metered into a chilling means. The apparatus disclosed in Lovette, Jr., on the contrary, does not include a storage bin or a metering discharge for feeding the rubber particles of that disclosure into the Lovette, Jr. cryogenic freezer. Indeed, the rubber particle feeding operation of Lovette, Jr. is primitive compared to that recited in Claim

26. Therein, large rubber particles, which range in size from 2 inches to 6 inches, are conveyed by a vibrating screener into a cryogenic freezer. Those rubber particles include all the ferrous metal and fiber present in the used tires from which the large rubber particles originate. To suggest that Lovette, Jr. solves the problem defined by the apparatus of Claim 26 is, in view of the above remarks, a major exaggeration.

In this regard, it should be appreciated that Claim 26 has been amended to correspond to amended Claim 17. That is, Claim 26, as amended, recites that granulated used rubber particles are granulated. An identical amendment has been made to each of Claims 27, 29, 30 and 34.

The fifth and final substantive ground of rejection is the rejection, under 35 U.S.C. §103(a), of Claims 8, 9, 16, 35-42 as being unpatentable over Memon taken in view of Lovette, Jr.

The patentability of the process of Claims 8 and 9 is predicated upon the patentability of amended Claim 1 from which each of Claims 8 and 9 depend. It is moreover emphasized that the specific limitations of Claims 8 and 9 are not so much as disclosed in Lovette, Jr. Comminution in Lovette, Jr. principally occurs in the Lovette, Jr. hammer mill 4. Other than stating that the hammer mill is operated at sufficient velocity to crack and grind the rubber into particles having a size of less than about $\frac{3}{4}$ of an inch, Lovette, Jr. does not teach or disclose varying the impact surface speed to control particle size distribution. The applied Lovette, Jr. comminution step merely comminutes very large rubber pieces, e.g. about 2 inches to 6 inches, to a still relatively large particle size of $\frac{3}{4}$ inch. Those skilled in the art appreciate that the processing step of controlling particle size distribution by varying impact surface speed and the space between the impact surface and the rebound surface is irrelevant to particles as

large as those utilized by Lovette, Jr. and especially to the comminuting means utilized in that disclosure. A hammer mill has no relevance to these claims, directed as they are to an impact mill.

Presumably, the allegation that Lovette, Jr. makes obvious the process of Claim 16, wherein three rubber particle size ranges are produced, is presumably based upon the screening cyclone operation conducted in the Lovette, Jr. disclosure at reference numeral 7. Although that operation results in three streams, only one of them, particle stream 26, is a product of that process. The process of Claim 16 emphasizes the flexible process of the present application wherein three very fine particle sizes, resulting in the production of powder rubber as well as crumb rubber, are produced. No such teaching is provided by the combined teaching of the references applied in the rejection of Claim 16.

The allegation that Claims 35-42 are unpatentable is traversed. Apparatus Claims 35 to 42 are not emulated by the Lovette, Jr. disclosure. In order to limit the length of these remarks, applicants will not address the specifics of each of the apparatus limitations set forth in Claims 27-34. A major reason for not addressing each of these claims in detail is the absence of any specific details in the outstanding Official Action. Suffice it to say, the Official Action provides no evidence that any of the structural limitations of any of Claim 27 to 34 are disclosed by either Memon or Lovette, Jr. The reason for this failure of the Official Action to address these details is because of none of the limitations of these rejected claims are so much as hinted at in either of these two references. In any event all of these claims ultimately depend from Claim 17, which the remarks, *supra*, establish to be patentable over the combined teach of Memon and Lovette, Jr.

The above remarks establish that the amended claims are patentable over the substantive grounds of rejection imposed in the outstanding Official Action. Reconsideration and rescinding of these grounds of rejection are therefore deemed appropriate. Such action is respectfully urged.

Applicants submit that none of the cited but not applied references anticipate or make obvious any of the claims of the present application. Neither do any of these references, when combined with each other or with any of the applied references, make obvious any of the claims of the present application.

The above amendments and remarks establish the patentable nature of all of the claims currently in this application. Notice of Allowance and passage to issuance of these claims, Claims 1, 2, 4-18 and 20-45, is therefore respectfully solicited.

Respectfully submitted,



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